Missouri Department of Natural Resources

Office Automation
Product Standards

prepared for the
EXECUTIVE STAFF

March 1997

Contents

Executive Summary

The Information Strategy Plan illustrates the department's commitment to improve services and efficiency, and many of the thirty-four (34) projects included in the plan require a solid technological foundation upon which to build. The Information Engineering Facility (IEF) client/server initiatives in progress are particularly dependent on a solid technical foundation because these complex applications perform part of their operations on the desktop computer, and interface through the network to a computer functioning as a server where other operations are performed. The basic foundation consists of many building blocks, such as a quality network infrastructure. Other key building blocks are standards: A standard desktop operating system, a standard desktop office suite, a standard network operating system, a standard messaging/calendaring platform, and a minimal desktop computer configuration.

Management Information Systems organizations are often asked why standards are so important. It is because they truly are part of the basic foundation upon which everything else is built. Continuing the construction metaphor, imagine how difficult it would be to build houses if some houses were built with English measurements, some with metric, and others using a mixture of three or four different measurement systems. Now, imagine trying to design a single window that would fit without modifications in any of these houses. This is similar to the problem that MIS faces: How to design systems and applications that work with every possible combination of operating system, office application, and hardware platform.

It is possible to design systems that will work in such mixed environments. However, this increases the complexity of designing systems, testing them, installing them, troubleshooting problems, training staff, and so on. Software developers attempting to support such mixed environments often invest millions of dollars in a single software application. Hence, without standards, tremendous amounts of time and money must be spent to develop a compatible and reliable application. A lack of standardization would cause MIS to commit much of its resources to keep a few systems running correctly. As a result, MIS will not be able to implement the new systems and applications listed in the ISP.

The MIS Program isn't the only location where staff productivity is lost because of a lack of standards. Staff members who change positions anywhere within the department must often learn a new operating system, word processor, spreadsheet, etc. Additionally, staff cannot share documents easily because file formats aren't compatible between applications, or draw easily on the

experience of their peers because everyone uses a different environment. All of these situations hinder “peer learning” and “mentoring”, two very important techniques for training and increasing productivity.

Many of the factors mentioned above contribute to a microcomputer’s Total Cost of Ownership (TCO). “Total Cost of Ownership” is a common term used to describe the various costs associated with the ownership and use of a microcomputer over its useful life, typically five years. A prominent industry consulting firm, Gartner Group, estimates the five year TCO for a typical computer purchased today is about $60,000. Following is a list of the major categories which contribute to this cost, and a brief explanation of how standardization can reduce costs in each of them.

- **Technical Support:** Training costs are reduced because it is only necessary to train support staff on one set of standard products, rather than numerous non-standard products. Help Desk costs are reduced because support staff can gain a better understanding of one set of standard products, reducing the time necessary to research problems and the need to pay for technical expertise from software vendors.

- **Administration:** The cost of installing computers and updating software is reduced because standard configurations can be readily duplicated, saving support staff time. Systems duplicated in this way are also much less likely to need follow-up support to correct problems with the initial installation. This saves time for both support staff and the customer.

- **Capitol:** The cost of purchasing computer software can be reduced by buying a standard software product in large quantities, resulting in significant discounts.

- **End-user Operations:** Training costs are reduced because it is only necessary to train department staff on one set of standard products, rather than numerous non-standard products. Further, department staff training is often only practical when standards are in place. Training is rarely cost-effective when each employee or even each program is using a different product. The need for retraining when staff are transferred or promoted into a position where different software is used can be an ongoing problem without standardization. Finally, training department staff leads to dramatic increases in staff computing productivity. This increase in overall staff productivity is the most significant benefit of standardization.

The need for standards is clear. The following pages provide recommendations for a standard desktop operating system, desktop office suite, network operating system, and a messaging/calendaring platform for the DNR. Recommendations for the minimal PC configuration will be addressed separately. Together, all these standards will contribute to a foundation for future Information Systems projects for years to come.

Desktop Operating System

Recommendation:	Products evaluated:
Microsoft Windows NT Workstation	• IBM OS/2 WARP • Microsoft Windows 95 • Microsoft Windows NT Workstation

Benefits

- Full 32 Bit Support
- Third Party Supported
- Availability of Desktop Applications
- Reliability
- Security
- Network Connectivity
- Vendor/Product Viability
- Use in Federal/State Government

Drawbacks

- Hardware requirement

Appendix 1 provides a list of other evaluation criteria that were considered for this recommendation.

Benefits:

Full 32 Bit Support - Modern desktop Operating Systems (OS's) and applications are being written in 32-bit code to take maximum advantage of current computer hardware, which is optimized to execute 32-bit code most efficiently. In addition, 32-bit code for Windows 95 / Windows NT executes using preemptive multitasking and multithreading. This allows active applications to share the computer's resources more equally, and results in better performance and stability. However, Windows 95 still uses significant amounts of 16-bit code in the OS, somewhat reducing these benefits. NT Workstation is the only desktop operating system that runs 32-bit Windows applications completely in 32-bit mode. OS/2 has no support for modern 32-bit Windows applications.

Third Party Supported / Availability of Desktop Applications - Third-party support is important because the company that wrote the OS can't possibly offer every conceivable software category a customer might need. Good third-party support makes it much more likely that software a customer wants to utilize will run on their OS. Almost all applications written for Windows 3.x and Windows 95 will also run on Windows NT. Microsoft requires applications to run on both Windows NT and Windows 95 before they can receive the "Windows 95 approved" logo. This ensures that new Windows applications will run on NT. Third-party support is OS/2's major drawback. There are not a substantial number of vendors writing OS/2 programs today, and even fewer new projects are being announced. To make matters worse, programs written for Windows 95 and NT will not run on OS/2. Most new applications written today are designed for 95 and NT. As a result, it will become harder and harder to find modern applications for OS/2. IBM has talked about eventually making OS/2 run the 32-bit applications designed for Windows 95 and NT. However, it is unclear if and when this will happen.

Reliability - NT Workstation uses various methods to prevent system crashes, such as: isolating active applications from each other, preventing applications from directly accessing hardware devices, prohibiting applications from locking up the mouse or keyboard, in addition to many other techniques. In NT Workstation, it is almost always possible to terminate any single misbehaving application and continue using the computer successfully. Such crash prevention techniques were not included in Windows 95 in order to maintain compatibility with older applications. As a result Windows 95 is far more prone to system crashes. OS/2 Warp uses some of the same techniques as NT Workstation to reduce system crashes, but is still not as robust as NT.

Security - NT Workstation provides the highest level of desktop operating system security available today without using add-on hardware and/or software. Most other operating systems require add-ons to provide even minimal security. Windows NT Workstation has been designed to meet the U.S. Department of Defense's National Computer Security Center (NCSC) specifications for a "C2 secure system". The C2 specification requires that a system meet numerous criteria that help protect the security and integrity of data and the network. As the NCSC says in its Final Evaluation Report of the Windows NT operating system: "When security is not an absolute requirement of the initial design, it is virtually impossible through later add-ons to provide the kind of uniform treatment to diverse system resources that Windows NT provides. Windows NT is secure from the ground up." The department can only benefit from using an OS that was designed from the ground up with security in mind.

Network Connectivity - NT Workstation includes support for almost every network protocol, adapter, client, and service in widespread use. Highlights of network support include full built-in Internet capability, remote network access (both dial-in and dial-out), and full DLC support for mainframe applications. More importantly, multiple network protocols, clients, services, and adapters can be used simultaneously, with no conflicts, memory restrictions, or other problems.

Vendor/Product Viability - Vendor/product viability is important because you want the standard you choose today to still be around next year, in three years, and hopefully beyond. Otherwise we will continually be implementing new standards. Microsoft is one of the largest software companies worldwide, has assets in the billions of dollars, and is unlikely to go out of business in the foreseeable future. NT Workstation is Microsoft's strategic OS. Windows 95 is marketed as an OS mainly for the home and portables, and cannot compete in an office with the reliability and security of NT. A minor upgrade to Windows 95, called Windows 97, may appear, but beyond that all versions of Windows will be based on NT. IBM's OS/2 Warp is a high-quality operating system from a technical standpoint, but IBM has already made statements that call into question whether further development of Warp as a desktop OS is likely.

Use in Federal/State Government - Many federal and state government agencies are standardizing on Windows NT Workstation because of the benefits listed above and others. Many, if not most, have avoided wide-scale adoption of Windows 95, waiting instead for NT. While government has historically been one of OS/2's biggest markets, IBM's failure to incorporate features such as full support for running 32-bit Windows programs into OS/2 make it less appealing as a strategic standard. One never knows what critical Windows standards IBM might fail to implement in future versions of OS/2, leaving customers with an OS that cannot support many modern applications.

Drawbacks:

Hardware Requirement - The major drawback to Windows NT Workstation is that a high-end Pentium computer with large amounts of RAM and disk space are needed for the OS to function effectively. However, Windows 95 and OS/2 both have similar hardware requirements if you want good performance with modern applications. This is particularly true of the IEF client/server applications DNR will be developing. It is now cost effective to purchase the appropriate hardware to run NT efficiently, and DNR will be replacing many obsolete computers in the next few years regardless of OS standards. A data processing standard is being written to address minimal requirements for

future hardware purchases. This will help ensure that equipment purchased today is adequate for modern operating systems and applications, and that obsolescence can be postponed for at least three to five years.

Summary:

Of the different desktop operating systems available, Windows NT Workstation is the one that best fits both where DNR is today and where we are trying to go. It offers superb reliability, security, efficient networking, and widespread industry support. Most importantly, it is a true 32-bit operating system with a clear future, and the most likely desktop operating system to still be viable in three to five years.

Desktop Office Suite

Recommendation:	Products evaluated:
Microsoft Office Suite	• Corel Office Suite • Lotus Smart Suite • Microsoft Office Suite

Benefits

- Integrates Very Well with NT
- The Leading Office Suite Nationally
- Compatible with Federal Government
- Compatible with What Other State Agencies are Using

Drawbacks

- Departmental staff training
- Support staff training

Appendix 1 provides a list of other evaluation criteria that were considered for this recommendation.

Benefits:

Integrates Very Well with NT - Desktop office suites must be designed to work well with the desktop operating system upon which they depend. All of the office suites evaluated will function with Microsoft Windows NT Workstation, but only Microsoft Office Suite integrates so seamlessly. This is not entirely unexpected since Microsoft makes both packages.

The Leading Office Suite Nationally - Microsoft Office is the market leader in office suites, consistently holding better than half the market for the last three years. The other major suites, Corel Office Suite (which includes WordPerfect) and Lotus Smart Suite (which includes Lotus 1-2-3), together have significantly less market share than Microsoft Office. This results in much less third-party support for these suites. Third-party support is important because the company that wrote the suite can't possibly offer every conceivable add-on category a customer might need. Good third-party support makes it much more likely that

any enhancements a customer wants to utilize will run with their suite. Poor market share in the software market also leads all too often to discontinuation or sale of such product lines. WordPerfect, which is now part of the Corel Suite, has changed owners twice in a few years with rewrites of the software each time, and its future at Corel is still a topic of much speculation. Stability is important because you want the standard you choose today to still be around next year, in three years, and hopefully beyond. Otherwise we will continually be implementing new standards. Microsoft is preparing to ship the next minor upgrade to their office suite in January 1997. Microsoft Office 97 maintains substantial compatibility with previous versions while continuing to add customer-requested features and enhancements. Office continues to be Microsoft's strategic office platform for the foreseeable future.

Compatible with Federal/State Government - Many federal and state government agencies are standardizing on the Microsoft Office Suite because of the benefits listed above and others. While there is some compatibility between the different office suites, to the extent that each suite tries to convert documents produced by competitors' products, this compatibility often falls short. We can enable easier and more reliable sharing of information with federal and other state agencies by standardizing on the most prevalent office suite; That suite is Microsoft Office. As significant as this compatibility is, the compatibility gained by standardizing on an office suite within the department will have an even more profound and positive effect on productivity.

Drawbacks:

Department staff / Support staff training - Regardless of which office suite is chosen as a standard, many people will be faced with change. Change is rarely easy, and in the computing arena change is best accompanied by quality staff training. This applies both to staff department-wide who will use the products, and support staff who must install and maintain the products and assist department staff in the use of the products. Unfortunately, because most department staff currently use separate applications from different vendors rather than a single office suite, change and training will be required for most staff regardless of which suite becomes the standard.

Summary:

Of the different office suites available, Microsoft Office is the one that best fits DNR's current and anticipated future needs. All of the major suites offer ease of use, good performance, flexibility, and other positive features. However, Microsoft Office is the suite most compatible with what both federal and other Missouri state government agencies are using. It also integrates very well with

the recommended operating system, Windows NT Workstation version 4.0; largely because Microsoft makes both products. Most importantly, it is a suite with a clear future, and the most likely office suite to still be viable in three to five years.

Network Operating System

Recommendation:	Products evaluated:
Microsoft Windows NT Server	• Microsoft Windows NT Server • Novell Netware Server • OS/2 Warp Server

Benefits

- Full 32 Bit Support
- Multi-thread Capable
- Multi-processor Capable
- Stability
- EPA/Department of Energy Delivering Applications Requiring NT
- Use in State Government
- Third Party Supported
- Vendor/Product Viability

Drawbacks

- Complex Directory Administration
- Limited Directory Services
- Limited Vendor Support
- Support Staff Training
- Change

Appendix 1 provides a list of other evaluation criteria that were considered for this recommendation.

Benefits:

Full 32 Bit Support - Modern Network server Operating Systems (NOS's) and applications are being written in 32-bit code to take maximum advantage of current server hardware, which is optimized to execute 32-bit code most efficiently. In addition, 32-bit code for Windows NT executes using preemptive multitasking and multithreading. This allows active applications to share the computer's resources more equally, and results in better performance and stability. Novell Netware is not a 32-bit NOS. OS/2 Warp Server is a 32-bit

NOS, but unfortunately it does not run 32-bit Windows applications, which have become the de-facto standard.

Multi-thread / Multi-processor Capable - Modern applications and services often have several simultaneous tasks they wish to perform. Without multi-threading, software must manage prioritization and scheduling of these different tasks itself. This is difficult to do well, and often leads to stability and performance problems. Multi-thread capability allows the NOS to handle the scheduling and prioritization, and in a much simpler and more efficient manner. The hardware can still only execute instructions one-by-one, but as far as the software and the user can tell, the tasks are occurring simultaneously. Multi-processor capability allows server performance to be dramatically enhanced simply by adding another processor chip to the system. The server itself must also support multiple processors, but many servers do. If the NOS doesn't support multiple processors, performance will not increase no matter how many processors are added to a server. NT Server and Warp Server both support multi-threading and multi-processing. Netware supports limited multi-threading, but a separate product, "Novell Netware SMP", is required to support multiple processors. This is a completely separate product from the original Netware, and has yet to receive the same industry acceptance.

Stability - NT Server uses various methods to prevent system crashes, such as: isolating active applications from each other, preventing applications from directly accessing hardware devices, prohibiting applications from locking up the mouse or keyboard, in addition to many other techniques. In NT Server, it is almost always possible to terminate any single misbehaving application and continue using the computer successfully. Netware suffers from problems caused by its unified execution model. For best performance, all processes run in a processor "ring", or working area, together. This boosts performance by eliminating ring transitions. Unfortunately, it also means any execution error by a single process can crash the entire server. Netware Loadable Modules (NLMs) are software written by Novell and third-parties. They are notoriously difficult to program correctly, and improperly written NLMs are responsible for sudden and many times unexplainable server crashes. Warp Server is a new product and as such doesn't have a proven track record for reliability. However, it is based on IBM's LAN Server technology, which historically has been reasonably robust.

EPA/Department of Energy Delivering Applications Requiring NT - Federal agencies that provide custom-written applications to the department are beginning to offer only versions that require NT Server to operate. Since the department's use of these applications is rarely optional, we will have to install and maintain NT servers. Since we must develop a knowledge base for NT

Server in order to maintain these systems regardless of department standards, NT becomes more attractive as a server standard. If we must learn and use it regardless, why not maximize the benefits of that knowledge and experience?

Use in State Government - State government agencies' MIS staffs tend to work together as peers, sharing information and experiences. Being able to consult with other agencies and draw on their knowledge base is very beneficial. However, this only works if other agencies are using the same products. Many if not most Missouri State government agencies are now using NT Server in some regard, with most expecting to increase their use of NT Server in the next year. There is less interest in Netware and Warp Server, particularly when looking toward the future.

Third Party Supported, Vendor/Product Viability - Third-party support is important because the company that wrote the NOS can't possibly offer every conceivable software category a customer might need. Good third-party support makes it much more likely that software a customer wants to utilize will run on their NOS. A significant number of third-party vendors now produce NT Server versions of their offerings, with many of these considering NT Server their strategic platform. Netware has excellent support as a file/print server, but not as an application server. This is largely because Netware makes a poor application server, mainly because of the complexity of writing reliable Netware Loadable Modules (NLMs). Since Warp Server is still a relatively new product, third-party support is currently limited.
Vendor/product viability is important because you want the standard you choose today to still be around next year, in three years, and hopefully beyond. Otherwise we will continually be implementing new standards. Microsoft is one of the largest software companies worldwide, has assets in the billions of dollars, and is unlikely to go out of business in the foreseeable future. NT Server is Microsoft's strategic NOS. Netware has already been pronounced "dead" by numerous trade journals and studies, largely because of its failure as an application server. Warp Server is a high-quality NOS from a technical standpoint, but IBM hasn't had much success recently in encouraging third-party support or development.

Drawbacks:

Complex Directory Administration / Limited Directory Services - NT Server uses a domain model for its user directory that does not work well in large distributed environments. Luckily, DNR's environment is actually rather centralized and relatively small in terms of directory complexity. Netware's Netware Directory Service (NDS) is a better technology, but in practice has so little third-party support that it is typically cumbersome to implement and

support. Warp Server uses a model somewhat similar to NT Servers, and has similar technical merits and limits.

Limited Vendor Support - All of the vendors in question must recover the costs of customer support in order to survive. Software pricing structures once permitted vendors to charge higher up-front prices for software, allowing them to offer lots of "free" support to their customers. Software profit margins are now too slim for free support to be practical. Any of the vendors, including Microsoft, will charge $100 an hour or more for support; charging such prices even for telephone support. Warp Server has an advantage in that IBM technicians are available for on-site software support, at a price. It would be very difficult to get on-site (vs. telephone) support for either NT Server or Netware directly from the vendor. This is one of the reasons that training support staff is so important. They must have the requisite knowledge of the products in order to reduce the need for costly vendor support.

Support Staff Training - Network Operating Systems (NOS's) are much more complex software than word processors or desktop operating systems. They are also more mission critical. A crashed server can cause lost productivity for hundreds of department staff. Training support staff is essential to having properly installed and maintained servers. Training also reduces vendor support costs because support staff better understand the products. Since support costs can approach the cost of a training class after only a few support questions, this is an important factor. Regardless of which NOS the department standardizes on, support staff training will be necessary since there is currently limited experience with each of these platforms.

Change - Change is rarely easy or welcome, but change is coming in the server area for the department regardless of which NOS is chosen as the standard. Old servers need to be replaced, and consolidation will replace many small servers with a few larger ones. Building new servers requires about the same amount of work regardless of the NOS involved. Therefore, many of the servers can be changed to the standard NOS when the server hardware is upgraded. This hardly makes the change painless, but it may make it more manageable.

Summary:

Of the many different Network Operating Systems (NOS's) available, Microsoft Windows NT Server is the one that best fits both where DNR is today and where we are trying to go. It offers superb stability, good multitasking support, and widespread industry support. Most importantly, it is a true 32-bit NOS with

a clear future, and the most likely network operating system to still be viable in three to five years.

Messaging/Calendaring/Tools ("Groupware")

Recommendation:	Products evaluated:
Lotus Notes and Domino	• Lotus Notes and Domino • Microsoft Exchange • Novell Groupwise

Benefits

- Cross platform nature of Notes clients
- Support for remote users
- Internet integration
- Flexible security architecture
- Groupware application development
- Use in State Government
- Third Party Supported
- Vendor/Product Viability

Drawbacks

- Complex Installation
- Support Staff Training

Groupware is one of the tools which, along with the network infrastructure, can have a very positive effect on staff productivity. Thus the roll-out of the infrastructure could bring with it the early benefits that Groupware can provide. These benefits include group scheduling and calendaring, remote and local access, timely information availability, and information repositories for policies, procedures, and forms. Groupware is a new and powerful tool for managing unstructured data. The core functionality and technical features required by DNR have been identified and matched with the top three groupware products.

Benefits:

Cross platform nature of Notes clients - This refers to the fact that a Notes database can be viewed by any Notes client software. In other words, if a

Notes database is created on a Windows based PC, that same database could be viewed by Notes client software on any other platform (e.g. OS/2, Macintosh, UNIX, etc.). This type of platform portability allows for a great deal of flexibility in establishing groupware services between DNR Divisions, Programs, external entities; and is unavailable in either of the other products.

Support for remote users - While all of the evaluated groupware packages include some level of support for remote users, Notes has a clear advantage. Notes' entire technical architecture is based on the concept of replication. Replication is simply a process of allowing multiple copies of a Notes database to be used and updated at the same time, updates are then resolved and only the updated fields are distributed to each copy of the database. Without this replication feature, groupware users must be attached to a network to use applications developed in the groupware environment. Notes users, who have this replication feature, can use groupware application without having to be attached to a network. Notes is the only groupware product that supports the use of custom groupware developed applications without being attached to a network. Notes also minimizes the network traffic by only distributing updated fields vs. the other packages updating of entire documents or folders. These features make Notes much more usable over slow 56Kbps and similar data circuits used by many remote offices.

Internet integration - The Internet will play a significant role in the final DNR technical architecture; therefore, a high level of integration between the selected groupware product and the Internet is critical. While Internet integration under the current releases of <u>all</u> groupware products is limited, Lotus' planned and announced Internet integration is by far the most clear picture of how groupware and the Internet can work together effectively. Current and planned Notes Internet integration includes the following:

- Web browser built into the Notes client.
- Domino web server built into the Notes server.
- The ability to build agents for searching the Internet.
- The ability to automatically publish a Notes database as a Web page on the Internet or on DNR's own Intranet using Domino.
- The ability to replicate Web pages to Notes servers and clients.

Note: This feature would allow DNR to provide much faster access to Internet content, as well as limit access to Web pages that are required for DNR business

By integrating groupware and Internet technologies using Lotus Domino, Notes and the Internet become complementary technologies, rather than competing technologies. Microsoft and Novell each have components that address many of the same issues, but each of the many components must be procured, installed, learned, and maintained separately. Only Lotus currently provides an integrated Internet solution.

Flexible security architecture - Each groupware product has a different approach to application level security. For example, Microsoft Exchange relies heavily on the security of the Windows NT Server operating system. Notes' approach to application level security is much different. Key components of the Notes security architecture include the following:

- Multi-level encryption
- Digital signatures
- Six levels of users access (Depositors, Readers, Authors, Editors, Designers and Managers)

Notes' approach to application level security simply adds another level of security on top of the server and client operating systems. Therefore, if Notes is installed on a Windows NT Server platform, all Windows NT Server security will still be in place, and Notes' security will simply be another layer of application level security. This places it clearly ahead of Exchange and Groupwise, as we will have more options to design and implement security.

Groupware application development - Development of custom groupware applications will provide a large portion of the benefits of groupware to DNR. There are two basic approaches to application development in groupware:

- Use high-end development tools. (e.g. Exchange with application development in Visual Basic)
- Integrate development tools with the groupware package. (e.g. Lotus Notes with LotusScript)

Notes' tightly integrated application development environment allows for users and developers to create simple Notes' based applications in a relatively short period of time. In addition, if more complex applications are required, Notes provides API'S for C and C++ application development. LotusScript has also been continuously improved to provide a much more robust application development environment. Notes lets local users add new applications with very little training and very low risk. If some local applications are wrong, the

cost to change is minimal. The most positive aspect is that some very creative solutions will come from local users.

Use in State Government - State government agencies' MIS staffs tend to work together as peers, sharing information and experiences. Being able to consult with other agencies and draw on their knowledge base is very beneficial. However, this only works if other agencies are using the same products. Many Missouri State government agencies are currently using Notes or are planning to start. Microsoft's Exchange solution is also popular, but lacks good Internet integration.

Third Party Supported, Vendor/Product Viability - Third-party support is important because the company that wrote the groupware solution can't possibly offer every conceivable software add-on a customer might need. Good third-party support makes it much more likely that software a customer wants to utilize will run with their groupware. A significant number of third-party vendors produce Notes-compatible offerings. Notes is also designed to work well with third-party products. For example, it integrates seamlessly with the Microsoft Office suite. Microsoft Exchange is gaining more support from third-parties, but not the same level as Notes. Novell Groupwise has limited support, and does not conform to the MAPI messaging standard. Vendor/product viability is important because you want the standard you choose today to still be around next year, in three years, and hopefully beyond. Otherwise we will continually be implementing new standards. IBM/Lotus is one of the largest companies worldwide, has assets in the billions of dollars, and is unlikely to go out of business in the foreseeable future. Lotus Notes is their strategic groupware and Internet platform. Microsoft continues to improve their product, but it still trails significantly behind Notes in market share. As a result, Microsoft continues to make drastic changes to Exchange, and drastic change is something we prefer to avoid once we standardize. Novell Groupwise is largely considered to be a niche product, and is used primarily in conjunction with the Novell Netware network operating system because of how well they integrate with each other.

Drawbacks:

Complex Installation - Notes offers significant capabilities and flexibility. Unfortunately, these benefits necessitate a rather involved installation and configuration process. Luckily, installation is only required once per server.

Support Staff Training - Groupware packages are much more complex software than word processors or desktop operating systems. They are also

more mission critical. A crashed groupware server can cause lost productivity for hundreds of department staff. Training support staff is essential to having properly installed and maintained groupware servers. Training also reduces vendor support costs because support staff better understand the products. Since support costs can approach the cost of a training class after only a few support questions, this is an important factor. Regardless of which groupware package the department standardizes on, support staff training will be necessary since there is currently limited experience with each of these platforms.

Technical Issues Summary

There are many technical advantages to implementing Notes as the groupware standard for DNR. Five of the most important advantages of Notes over Exchange and Groupwise are discussed above. The following table includes a more comprehensive list of the current and planned technical features of each groupware solution:

Technical Feature	Availability		
	Lotus Notes	Microsoft Exchange	Novell Groupwise
Cross platform file and database sharing	✓	No plans	✓
Support for stand-alone mobile users	✓	>6 months	✓
Internet Integration	✓	>6 months	✓
Standalone security architecture	✓	No plans	✓
Integrated applications development	✓	Requires separate product	No plans
Support for ALL major desktop operating systems	✓	No plans	No plans
Support for ALL major server operating systems	✓	No plans	No plans
Support for group scheduling	✓	✓	✓
Multiple client software license options	✓	✓	✓
Support for industry standard messaging (e.g. X400, X.500, etc.)	✓	✓	✓
Support for MAPI mail client	✓	✓	>6 months
Automated Internet publishing (i.e. Web page)	✓	Requires separate product	No plans
Integrated SNMP management	✓	No plans	No plans
Support for development of "intelligent agents"	✓	Limited	No plans
Support for load balancing between database servers	✓	No plans	No plans
Mail, directories and applications based on a single database architecture	✓	No plans	No plans
Support for field level replication	✓	No plans	No plans
Full-text search capability	✓	requires separate product	requires separate product

Highlights:

The acceptance and implementation of a groupware package provides several early benefits to DNR. Some of these include productivity and efficiency improvements that can be achieved before the infrastructures are fully implemented state-wide. Obviously, if these functionality's involve accessing information from other locations within the state, these will be initially limited,

but will expand as more locations are added to the Notes System. Until the groupware is fully connected, there can still be early benefits within local programs and divisions. Several examples of benefits which result from implementing groupware with the new infrastructure are listed below:

Centralized repository for reference and official information

A centralized repository of updated sources for policy manuals, forms, reports, and other official information will become available. This will eliminate the need for clerks to spend time updating officially issued policy and procedure manuals. They will not need to search all over for 'that new form' that was just issued or wait for it to come in the mail.

Access to Internet-provided information

Groupware provides a mechanism to obtain information not presently available to DNR. Routinely needed information (such as the House and Senate bill tracking) can be captured from Internet pages and converted to Notes database entries automatically. This will provide DNR access to desired information in a timely fashion without the issues of multiple Internet access, accounts and oversight.

Automated forms filling and transmission

Forms can be completed within the groupware package and printed out or transmitted and tracked electronically. This reduces the need for paper distribution of forms. Some examples of such forms include: DPSR's, Time Accounting, Inventory tracking, etc..

Standardized interface and application functions

DNR staff need standardized applications so they do not need to learn many different systems. They would be able to sit down at any computer within the DNR system and access information as if they were at their own desks. In many cases, staff could learn only the groupware package and be able to access the information they need.

Enhanced Messaging and electronic mail

The groupware package will provide an enhanced electronic mail interface that will permit the communication of large documents without sending large messages and access to mail when away from the office. It can support sequential routing of messages. During implementation, it will communicate well with DNR's existing Microsoft Mail system. It will also provide connectivity to many other electronic mail systems outside DNR.

Contact and Task management

The groupware package (with it's data base, full text search, enhanced messaging, and integrated application environment) can quickly deliver contact and task management workflow applications to the department.

Summary:

There seems to be little doubt that Lotus Notes is the leading groupware product in the industry today. Lotus Notes will provide significant benefits to DNR by automating many processes which have not been automated in the past. The automation of "unstructured" data with Notes takes a fraction of the time required by conventional development tools. Furthermore, the introduction of Notes to DNR will not compete with the automation of structured data. Some of the benefits of automating unstructured data are:

- Creates a technology - cognizant work force
- Can bring all programs together in an electronic information workgroup
- Develops a form of DNR memory via the document storage and discussion database
- Provides considerable organizational flexibility both in personal customization of desktop views and in the almost instant creation of short-term electronic workgroups

From a technical, functional, or cost consideration Notes stands out as a current robust, statewide agent for upgrading the processing of "unstructured" information at all levels of DNR. Furthermore, as a powerful data processing architecture, many small applications can be immediately developed and made available to DNR while the procurement and roll out of strategic ISP Composer (IEF) developed application systems take place.

As fast as DNR can be aligned to the Computer/Communication Infrastructure Standards, Notes applications can be made available to DNR personnel. With additional planning and development, new electronic forms of data interchange with external users can also take place in advance of more sophisticated facilities as part of a public access system. Finally, the currently available facilities for bringing the Internet into DNR and "bridging" to the public via the Internet are opportunities that should not be delayed.

NOTE - DNR MIS wishes to thank the State Courts for the use of their detailed evaluation of groupware products.

Appendix 1

Desktop Operating System Evaluation Criteria

- Full 32 bit support
- Internet access
- Performance
- Installability
- Multitasking
- TCP/IP support
- Administration tools
- Department staff training
- Vendor/Product viability
- Adherence to standards
- Flexibility
- Certified technicians
- Use in State government
- Crash resistant
- Ease of use
- Password protected
- Strong application platform
- Memory management
- Migration tools
- Support staff training
- Market share
- Use in Federal government
- Third party support
- Remote access
- Network connectivity
- Vendor support
- Availability of applications
- Configuration management
- Hardware requirement

Desktop Office Suite Evaluation Criteria

- Integrates with NT
- Ease of use
- Performance
- Hardware requirements
- Adaptability to DNR needs
- Department staff training
- Market share
- Use in Federal government
- Compatible with State Agencies
- Flexibility
- Installability
- Print functions
- Network connectivity
- Support staff training
- Vendor/Product Viability
- Adherence to standards
- Convertibility
- Support for DOS/windows
- Vendor support
- Administration tools
- Seamless integration
- Certified technicians
- Use in State government

Network Operating System Evaluation Criteria

- Directory services
- Fault tolerant
- Remote user support
- Basic file sharing
- Multi-thread capable
- Advanced services
- Security services
- Client support
- Administration tools
- Vendor support
- Full 32 bit support
- Market share
- Single log-on to network
- Scaleable
- Flexibility
- Support for DOS/windows
- Multi-processor capable
- Use in Federal government
- Use in State government
- Data encryption
- Adherence to standards
- Administration functions
- Support staff training
- Vendor/Product viability
- Third party support
- Single point administration
- Moving a user
- File services
- Mirrored server
- Backup and restore
- Audit trails
- Performance
- Connectivity options
- Certified technicians

- Hardware requirements